

1 **METHOD AND APPARATUS FOR**
2 **LOADING A RIBBON CABLE INTO A JACKET**

3 FIELD OF THE INVENTION

4 This invention relates generally to a method and apparatus for
5 loading a ribbon cable into a jacket.

6 DESCRIPTION OF THE RELATED ART

7 Ribbon cables are used in the wiring of medium and large scale
8 electronic equipment such as computer hardware. A significant cost-
9 savings is realized by using ribbon cable versus stringing individual
10 conductors because mass termination techniques may be employed with
11 ribbon cables.

12 Mass terminating can only occur on a segment of a ribbon cable
13 in which the wires are essentially straight and parallel to one another. Yet
14 in most instances, the major portion of the wire pairs in a ribbon cable are
15 twisted and mass terminating cannot occur in the twisted portion. Twisted
16 pair multi-conductor ribbon cables are thus designed with intermittent
17 parallel wire sections that are used to cut the ribbon cable to length for
18 mass termination.

19 A twisted pair multi-conductor ribbon cable should be cut at the
20 intermittent parallel sections to length before it is placed within a
21 protective jacket.

There are many types of ribbon cable assemblies available. U.S. Patent No. 5,367,123 to Plummer, III et al. discloses a tubular sheath for a ribbon cable in which a strip is folded around the ribbon cable to form the sheath.

U.S. Patent No. 4,837,405 to Bonjour et al. discloses an insulating jacket containing rolled ribbon cable in which markings are placed on the outside of the jacket to indicate where bonded sections of the ribbon cable are located.

U.S. Patent No. 4,992,625 to Izui et al. discloses a ribbon cable with a sheath, in which the sheath has bonded and non-bonded segments and the ribbon is rolled into an s-shape and encased in the sheath.

It is desirable to provide a device that can load a ribbon cable into a protective jacket before the cable is cut to its required installation length.

SUMMARY OF THE INVENTION

In accordance with one aspect, the present invention provides a loading device for a ribbon cable. The device includes a leader with a first end and a second end with a jacket enclosing the leader. The device also includes means for attaching the second end of the leader to the cable. The first end of the leader is used for pulling the leader through the jacket.

In accordance with another aspect of this invention, it is further

desirable to provide a method of loading a ribbon cable inside a jacket. The method comprising the steps of extruding a leader inside a jacket, cutting the jacket with the leader extruded inside to length, attaching one end of the leader to the cable, pulling the leader through the jacket until a parallel wire section of the cable is exposed at an end of the jacket and cutting the ribbon cable at the exposed parallel wire section to length.

In accordance with another aspect of this invention, it is further desirable to provide a method of making a ribbon cable enclosed inside a jacket to a specified length. The method comprising the steps of cutting a leader to length, extruding a jacket over the leader, cutting the jacket with the leader extruded inside to length, providing a ribbon cable, attaching one end of the leader to the ribbon cable, pulling the leader through the jacket until a parallel wire section of the ribbon cable is exposed at an end of the jacket, and cutting the ribbon cable to length.

These and other aspects of this invention are illustrated in the accompanying drawings, and are more fully disclosed in the following specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a ribbon cable with parallel and twisted wire sections;

FIG. 2 is a perspective view of a leader enclosed within a jacket as provided for in the present invention;

1 FIG. 3 is a perspective view of a ribbon cable attached to the
2 second end of a leader for loading a ribbon cable as provided for in the
3 present invention; and

4 FIG. 4 is a perspective view of a ribbon cable loaded with the
5 jacket and the parallel wires of the cable cut to length as provided for in
6 the present invention.

7 DESCRIPTION OF THE INVENTION

8 The invention can provide a jacket or sheath equipped with a
9 leader that is designed to load a cable into a jacket before the cable is
10 cut to its required installation length.

11 In particular, the invention provides for a loading device for a
12 cable, the loading device consists of a leader with a first end and a
13 second end and a jacket enclosing the leader. The cable is attached to
14 the second end of the leader and the first end of the leader is used for
15 pulling the leader through the jacket.

16 More specifically, a ribbon cable is configured such that it should
17 only be cut at certain intervals where parallel sections of individual
18 insulated wires are bonded together. Thus, it is not desirable to extrude
19 the sheath directly around the ribbon cable, since this would prevent the
20 proper cutting locations from being easily located. Therefore, the ribbon
21 cable may be cut to length after it is placed within a protective jacket.

22 Accordingly, in order to facilitate easy loading of the ribbon cable

1 into the jacket, the jacket is extruded around a leader, for example, a
2 continuous strip of felt that has approximately the same dimensions as the
3 ribbon cable. By pulling the leader through the jacket, the ribbon cable
4 is easily loaded into the jacket. In addition to having the required strength
5 for the loading operation, the leader should be from a desirable material
6 that elongates and narrows as it is pulled through the jacket. This necking
7 down of the leader allows it to pull away from the inner walls of the jacket
8 and to pass more easily through the jacket.

9 Referring now to FIG. 1, shown is an example of a cable, for
10 example, a twisted pair multi-conductor cable **10**, or a ribbon cable with
11 parallel **12** and twisted wire sections **11**. The cable **10** is configured such
12 that it should only be cut at certain intervals where parallel insulated wires
13 **12** are bonded together. In the present invention, the cable **10** may be
14 cut to its final length at these certain intervals after it is placed within a
15 jacket **20**.

16 As shown in FIG.2, the jacket may be extruded around a leader **30**
17 that may be cut to a predetermined length from a longer length, such as
18 from a supply roll. The leader **30** may be cut to a length that is
19 approximately the same dimension as the cable **10**.

20 The leader **30**, for example, may comprise a continuous piece of
21 felt. In addition to having the required strength for the loading operation,
22 the felt **30** is a desirable material for this purpose because it elongates
23 and narrows as it is pulled through the jacket **20**. This necking down of the

felt allows it to pull away from the inner walls of the jacket and to pass more easily through the jacket **20**. The following table specifies example property values for felt materials, as for example, for a white non-woven polyester felt via a needle loom 6 denier, 2 inch min., staple polyester fibers which are mechanically interlocked.

| <u>Properties</u> | <u>Units</u> | <u>Value</u> |
|-------------------|--------------------|--------------|
| Tensile | lbs | 125-200 |
| Elongation | % | 75 -125 |
| Thickness | inches | 0.02-0.20 |
| Weight | oz/yd ² | 2-20 |
| Width | inches | 1/8 - 15 |

The jacket **20**, for example, may comprise a thin wall PVC compound, or vinyl jacket. The following table specifies example property values for jacket materials, as for example, for an EX-1911 Natural PVC Compound Pigmented black.

| <u>Properties</u> | <u>Units</u> | <u>Value</u> |
|----------------------------|--------------|--------------|
| Color | Munsell | Black N1.5 |
| Extrusion Thickness | Inches | 0.005-0.100 |
| Specific Gavity | | 1.0-1.6 |
| Shore A Hardness | | 40-100 |
| Tensile Strength | psi | 2250 |
| Elongation | % | 365 |

| <u>Properties</u> | <u>Units</u> | <u>Value</u> |
|----------------------------|-----------------|--------------|
| 100% Modulus | psi | 1165 |
| Oxygen Index | | 10-50 |
| UL 94 Vertical burn | .075" sample | V-0 |
| UL 94 Thin Wall | | VTM-0 |

Referring to FIG. 3, once the leader and jacket combination is cut to length, the ribbon cable **10** can be attached by means **40** to an exposed end (e.g., a second end **34**) of the leader **30**. A first end **32** of the leader **30** is used by an operator to grab and pull the leader through the jacket **20**, with the second end **34** of the leader being attached to the ribbon cable **10** by the attachment means **40**. (e.g., by a fastener).

As shown by the example in FIG. 3, the leader may be attached by the use of staples **40** as the attachment means. Other types of attachment means that produce similar tension strength may also be utilized. These attachment means **40** may include adhesives, clips and bands.

By pulling the leader **30** through the jacket **20**, as shown in FIG. 4, the ribbon cable **10** is easily loaded into the jacket and may be cut to length at the parallel wire section **12**.

Although the invention has been shown and described with respect to certain embodiments, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon reading and

- 1 understanding of the specification. The present invention includes all
- 2 such equivalent alterations and modifications, and is limited only by the
- 3 scope of the claims.